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NEW JERSEY DEPT OF ENVIRONMENTAL PROTECTION TRENTON --ETC F/6 13/13
NATIONAL DAM SAFETY PROGRAM. HEADLEYS POND DAM (NJ00790); DELAW--ETC(U)
MAY 81 R J MCDERMOTT; J E GRIBBIN DACW61-79-C-0011

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DELAWARE RIVER BASIN
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SUSSEX COUNTY
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HEADLEYS POND DAM

NJ 00790

PHASE 1 INSPECTION REPORT NATIONAL DAM SAFETY PROGRAM



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DEPARTMENT OF THE ARMY

Philadelphia District
Corps of Engineers
Philadelphia, Pennsylvania

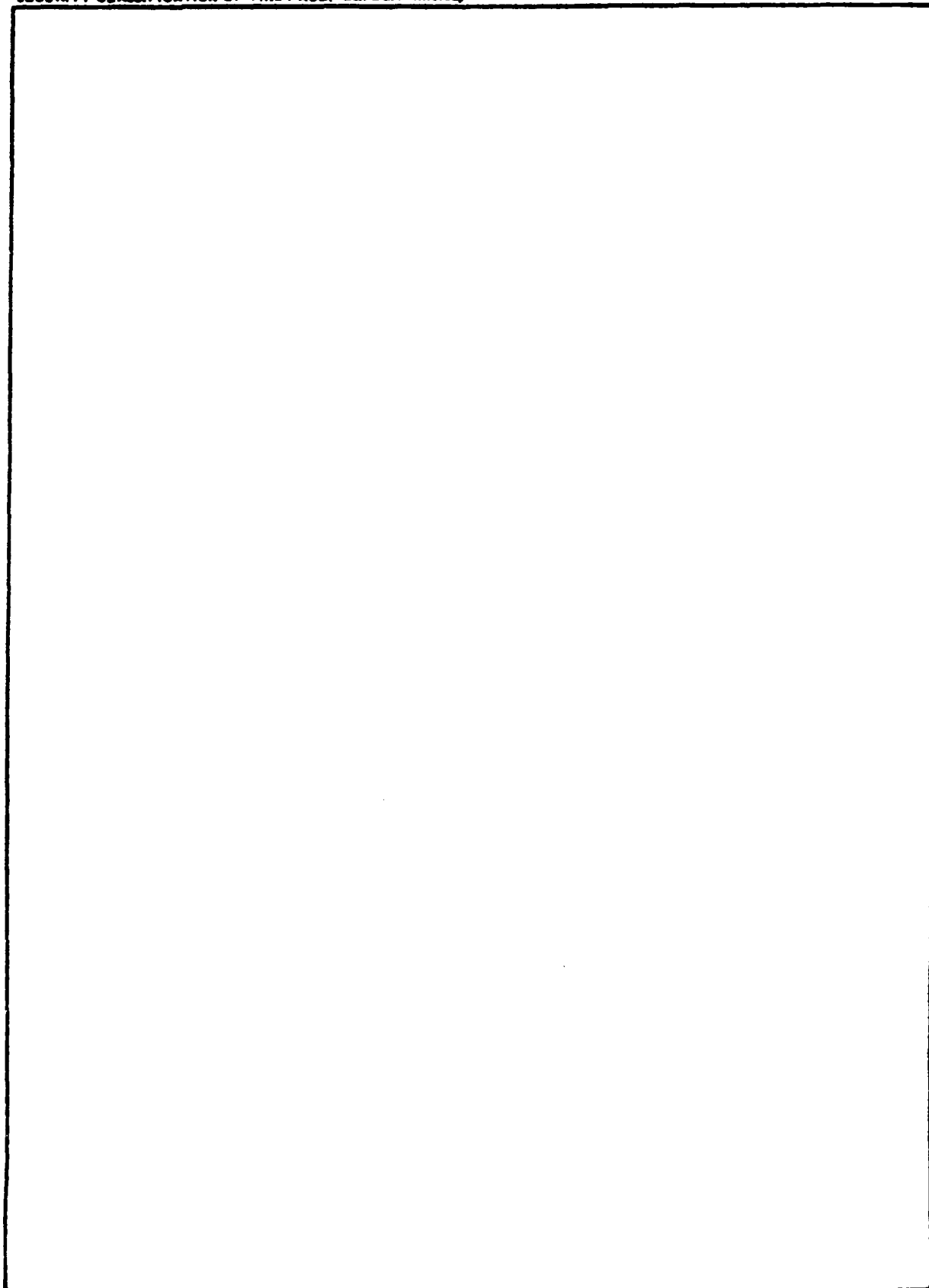
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REPT. NO: DAEN/NAP-53842/NJ00790-81/05

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER DAEN/NAP-53842/NJ00790-81/05	2. GOVT ACCESSION NO. AD A102 731	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Phase I Inspection Report National Dam Safety Program Headleys Pond Dam, NJ00790 Sussex County, NJ		5. TYPE OF REPORT & PERIOD COVERED FINAL
7. AUTHOR(s) McDermott, Richard J., P.E. Gribbin, John E., P.E.		6. PERFORMING ORG. REPORT NUMBER
9. PERFORMING ORGANIZATION NAME AND ADDRESS Storch Engineers 220 Ridgedale Ave. Florham Park, NJ 07932		8. CONTRACT OR GRANT NUMBER(s) DACW61-79-C-0011
11. CONTROLLING OFFICE NAME AND ADDRESS NJ Department of Environmental Protection Division of Water Resources P.O. Box CN029 Trenton, NJ 08625		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) U.S. Army Engineer District, Philadelphia Custom House, 2d & Chestnut Streets Philadelphia, PA 19106		12. REPORT DATE May, 1981
		13. NUMBER OF PAGES 50
		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited.		
17. DISTRIBUTION STATEMENT (of the abstract) National Dam Safety Program. Headleys Pond Dam (NJ 00790), Delaware River Basin, Tributary to Paulins Kill River, Sussex County, New Jersey. Phase I Inspection Report.		
18. SUPPLEMENTARY NOTES Copies are obtainable from National Technical Information Service, Springfield, Virginia 22151.		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Dams National Dam Safety Program Spillways Embankments Headleys Pond Dam, NJ Visual Inspection Sussex County, NJ Structural Analysis Paulins Kill River, NJ Embankment Delaware River Basin		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report cites results of a technical investigation as to the dam's adequacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report.		

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Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, New Jersey 08621

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Headleys Pond Dam, Sussex County, New Jersey which has been prepared under authorization of the Dam Inspection Act, Public Law 92-367. A brief assessment of the dam's condition is given in the front of the report.

Based on visual inspection, available records, calculations and past operational performance, Headleys Pond Dam, initially listed as a high hazard potential structure, but reduced to a significant hazard potential structure as a result of this inspection, is judged to be in fair overall condition. The dam's spillway is considered inadequate because a flow equivalent to 13 percent of the One Hundred Year Flood would cause the dam to be overtopped. To ensure adequacy of the structure, the following actions, as a minimum, are recommended:

a. The spillway's adequacy should be determined by a qualified professional consultant engaged by the owner using more sophisticated methods, procedures and studies within six months from the date of approval of this report. Within three months of the consultant's findings, remedial measures to ensure the spillway adequacy should be initiated.

b. Within six months from the date of approval of this report, the owner should engage a qualified professional consultant who will:

- (1) Investigate the need for a low level outlet to drain the lake.
- (2) Inspect the embankment, especially the stone rubble portion of the dam, when the lake is drawn down and when the lake is filled making any subsoil, seepage, and structural investigations needed.

Within three months of the consultants findings, remedial measures should be determined and implemented.

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Honorable Brendan T. Byrne

c. Within six months from the date of approval of this report the following remedial actions should be initiated:

(1) Concrete cap and abutments forming spillway crest should be reconstructed.

(2) Trees and other adverse vegetation on the embankments should be removed.

d. The owner should develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam within one year from the date of approval of this report.

e. An emergency action plan and effective warning system should be developed which outlines actions to be taken by the owner to minimize the downstream effects of an emergency at the dam within six months from the date of approval of this report.

A copy of the report is being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, the designated State Office contact for this program. Within five days of the date of this letter, a copy will also be sent to Congressman Courter of the Thirteenth District. Under the provision of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request, five days after the date of this letter.

Additional copies of this report may be obtained from the National Technical Information Services (NTIS), Springfield, Virginia 22161 at a reasonable cost. Please allow four to six weeks from the date of this letter for NTIS to have copies of the report available.

An important aspect of the Dam Inspection Program will be the implementation of the recommendations made as a result of the inspection. We accordingly request that we be advised of proposed actions taken by the State to implement our recommendations.

Sincerely,



ROGER L. BALDWIN

Lieutenant Colonel, Corps of Engineers
Commander and District Engineer

1 Incl
As stated

Copies furnished:

Mr. Dirk C. Hofman, P.E., Deputy Director
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

Mr. John O'Dowd, Acting Chief
Bureau of Flood Plain Regulation
Division of Water Resources
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P.O. Box CN029
Trenton, NJ 08625

HEADLEYS POND DAM (NJ00790)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 30 December 1980 and 1 March 1981 by Storch Engineers, under contract to the State of New Jersey. The State, under agreement with the U.S. Army Engineer District, Philadelphia, had this inspection performed in accordance with the National Dam Inspection Act, Public Law 92-367.

Headleys Pond Dam, initially listed as a high hazard potential structure, but reduced to a significant hazard potential structure as a result of this inspection, is judged to be in fair overall condition. The dam's spillway is considered inadequate because a flow equivalent to 13 percent of the One Hundred Year Flood would cause the dam to be overtopped. To ensure adequacy of the structure, the following actions, as a minimum, are recommended:

a. The spillway's adequacy should be determined by a qualified professional consultant engaged by the owner using more sophisticated methods, procedures and studies within six months from the date of approval of this report. Within three months of the consultant's findings, remedial measures to ensure the spillway adequacy should be initiated.

b. Within six months from the date of approval of this report, the owner should engage a qualified professional consultant who will:

(1) Investigate the need for a low level outlet to drain the lake.

(2) Inspect the embankment, especially the stone rubble portion of the dam, when the lake is drawn down and when the lake is filled making any subsoil, seepage, and structural investigations needed.

Within 3 months of the consultants findings, remedial measures should be determined and implemented.

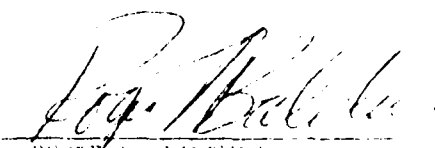
c. Within six months from the date of approval of this report the following remedial actions should be initiated:

(1) Concrete cap and abutments forming spillway crest should be reconstructed.

(2) Trees and other adverse vegetation on the embankments should be removed.

d. The owner should develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam within one year from the date of approval of this report.

e. An emergency action plan and effective warning system should be developed which outlines actions to be taken by the owner to minimize the downstream effects of an emergency at the dam within six months from the date of approval of this report.

APPROVED: 

ROGER L. BALDWIN

Lieutenant Colonel, Corps of Engineers
Commander and District Engineer

DATE: 

PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam:	Headleys Pond Dam, I.D. NJ00790
State Located:	New Jersey
County Located:	Sussex
Drainage Basin:	Delaware River
Stream:	Tributary to Paulins Kill River
Dates of Inspection:	December 30, 1980 March 1, 1981

Assessment of General Condition of Dam

Based on visual inspection, past operational performance and Phase I engineering analyses, Headleys Pond Dam is assessed as being in fair overall condition.

Based on investigations of the downstream flood plain made in connection with this report, it is recommended that the hazard potential classification be downgraded from high to significant hazard.

Hydraulic and hydrologic analyses indicate that the spillway is inadequate. Discharge capacity of the spillway is not sufficient to pass the designated spillway design flood (100-year storm) without an overtopping of the dam. The spillway is capable of passing approximately 12 percent of the spillway design flood. Therefore, the owner should engage a professional engineer experienced in the design and construction of dams in the near future to perform more accurate hydraulic and hydrologic analyses relating to the spillway capacity. Based on the findings of the analyses, the need for and type of remedial measures should be determined and then implemented.


The owner should, in the near future, develop an emergency action plan together with an effective warning system outlining actions to be taken by the operator to minimize downstream effects of an emergency at the dam.

In addition, it is recommended that the following remedial measures be undertaken by the owner in the near future.

- 1) The ability to drain the lake should be investigated by an engineer experienced in the design and construction of dams. If the need for a low level outlet is determined, a suitable outlet should be designed and installed.
- 2) The stone rubble portion of the dam should be thoroughly inspected by a professional engineer experienced in the design and construction of dams. The dam should be inspected with the lake drawn down and with the lake filled. Based on the inspections, together with any necessary subsoil, seepage and structural investigations, remedial measures to correct the leakage and other possible causes of distress should be determined and then implemented.
- 3) Concrete cap and abutments forming spillway crest should be reconstructed.
- 4) Trees and other adverse vegetation on the embankments should be removed.

In the future, the owner of the dam should develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam.


Richard Q. McDermott, P.E.


John E. Gribbin, P.E.



OVERVIEW - HEADLEYS POND DAM

20 JANUARY 1981

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. It is important to note that the condition of dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that the unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydraulic and hydrologic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydraulic and hydrologic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I INSPECTION REPORT

NATIONAL DAM SAFETY PROGRAM

HEADLEYS POND DAM, I.D. NJ00790

SECTION 1: PROJECT INFORMATION

1.1 General

- a. Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The Division of Water Resources of the New Jersey Department of Environmental Protection (NJDEP) in cooperation with the Philadelphia District of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the State of New Jersey. Storch Engineers has been retained by the NJDEP to inspect and report on a selected group of these dams. The NJDEP is under agreement with the Philadelphia District of the Corps of Engineers.

- b. Purpose of Inspection

The visual inspections of Headleys Pond Dam were made on December 30, 1980 and March 1, 1981. The purpose of the inspections was to make a general assessment of the structural integrity and operational adequacy of the dam structure and its appurtenances.

1.2 Description of Project

a. Description

Headleys Pond Dam is a gravity dam of stone rubble construction. The spillway which is in the form of a broad crested weir with a concrete cap forms the major portion of the dam. At each end of the spillway section, the dam is formed by earth embankments.

Immediately downstream from the dam a paved roadway is located. Discharge from the dam flows under the road by means of a stone arch and concrete box culvert. The culvert has a stone arch section comprising its upstream portion and a concrete box section comprising its downstream portion. The road embankment is braced with steel structural members at each end of the culvert and tied by four steel tie rods. The upstream portion of the brace is partially supported by concrete buttresses at the toe of dam.

The elevation of the spillway crest is 655.5, National Vertical Geodetic Datum (N.V.G.D). The crest of the dam is at elevation 657.0 and the downstream channel bed elevation is 638.6. The overall length of the dam is 60 feet and its height is 18.4 feet.

b. Location

Headleys Pond Dam is located in the Township of Fredon, Sussex County, New Jersey. Principal access to the dam is by Paulins Kill Road, Route 614. Discharge from the spillway flows through the culvert under Route 614 and into a stream tributary to Paulins Kill River.

c. Size and Hazard Classification

The dam is classified in accordance with criteria presented in "Recommended Guidelines for Safety Inspection of Dams" published by the U.S. Army Corps of Engineers. Size categories consist of Small, Intermediate and Large while hazard categories are designated as Low, Significant and High.

Size Classification: Headleys Pond Dam is classified as "Small" size since its maximum storage volume is 51 acre-feet (which is less than 1000 acre-feet) and its height is 18.4 feet (which is less than 40 feet).

Hazard Classification: Visual inspection of the downstream flood plain of the dam together with breach analysis indicate that failure of the dam could inundate the county roadbridge of Route 614 located immediately downstream from the dam and inundation of Route 614 approximately 2200 feet downstream from the dam. It is not anticipated that dam failure during a storm equivalent to the SDF would cause inundation of a dwelling located approximately 500 feet from the dam and less than a few lives would be expected to be lost. Analyses also indicate that two county road bridges, located approximately 3500 and 6500 feet downstream from the dam, would not be inundated. Accordingly, Headleys Pond Dam is classified as "Significant" hazard.

d. Ownership

Headleys Pond Dam is owned and operated by Stanley H. Peter, 3912 Coconut Terrace, Bradenton, Florida 33505.

e. Purpose of Dam

The purpose of the dam is the impoundment of a lake used for recreation. Reportedly, local residents refer to the impoundment as the Old Mill Pond.

f. Design and Construction History

Reportedly, Headleys Pond Dam was constructed prior to 1900 by a private owner for the purpose of powering a mill. There was evidence of a smaller breached dam located approximately 400 feet downstream from Headleys Pond Dam where perhaps the mill had been situated. No remains of a mill were observed.

g. Normal Operational Procedures

Reportedly, the dam and appurtenances are maintained by the owner. There is no fixed schedule of maintenance; repairs are made as the need arises. No evidence of operating facilities was observed at the times of inspection.

1.3 Pertinent Data

a.	Drainage Area	1.44 square miles
b.	Discharge at Damsite	
	Maximum flood at damsite	August 1955 (Peak flow unknown)
	Outlet Works at pool elevation	N.A.
	Spillway capacity at top of dam	194 cfs
c.	Elevation (N.G.V.D.)	
	Top of Dam	657.0
	Maximum pool-design surcharge	660.5
	Recreation pool	655.0
	Spillway crest	655.5
	Stream bed at centerline of dam	638.6
	Maximum tailwater	644 (Estimated)

d. Reservoir

Length of maximum pool	800 feet (Scaled)
Length of recreation pool	750 feet (Scaled)

e. Storage (Acre-feet)

Recreation pool	37 acre-feet
Maximum pool - design surcharge	78 acre-feet
Top of dam	51 acre-feet

f. Reservoir Surface (acres)

Top of dam	7.5 acres (Estimated)
Maximum pool - design surcharge	9.3 acres (Estimated)
Recreation pool	7.0 acres

g. Dam

Type	Stone Rubble Gravity
Length	60 feet
Height	18.4 feet
Sideslopes - Upstream	Unknown
- Downstream	1 Horiz. to 6 Vert. (Approx.)
Zoning	Unknown
Impervious core	Unknown
Cutoff	Unknown
Grout curtain	Unknown

h. Diversion and Regulating Tunnel N.A.

i. Spillway

Type	Concrete Weir
Length of weir	40 feet
Crest elevation	655.5
Gates	N.A.
Upstream channel	N.A.
Discharge channel	Arch and Box Culvert

j. Regulating Outlet

N.A.

SECTION 2: ENGINEERING DATA

2.1 Design

No plans or calculations pertaining to the original construction of the dam could be obtained. Drawings prepared in 1956 entitled, "Plans of Proposed Reconstruction of Bridge No. 40" and a drawing prepared in 1968 entitled "Plans of Temporary Repairs to Bridge No. 40" for the County culvert located immediately downstream are on file with the County of Sussex Engineering Department and show a limited portion of the dam.

2.2 Construction

No data or reports pertaining to the construction of the dam are available.

2.3 Operation

Reportedly, no maintenance reports are on file. No data pertaining to operations are available.

2.4 Evaluation

a. Availability

Available engineering data is limited to that which is on file with the County of Sussex Engineering Department. The file contains drawings relating to downstream bridge improvements.

b. Adequacy

Available engineering data pertaining to Headleys Pond Dam is not adequate to be of significant assistance to the performance of a Phase I evaluation. A list of absent information is included in paragraph 7.1.b.

c. Validity

The representation of the dam on the bridge improvement drawings was generally consistent with data obtained by field inspections.

SECTION 3: VISUAL INSPECTION

3.1 Findings

a. General

The inspections of Headleys Pond Dam were performed on December 30, 1980 and March 1, 1981 by staff members of Storch Engineers. A copy of the visual inspection check list is contained in Appendix 1. The following procedures were employed for the inspection:

- 1) The embankment of the dam, appurtenant structures and adjacent areas were examined.
- 2) The embankment and accessible appurtenant structures were measured and key elevations determined by surveyor's level.
- 3) The embankment, appurtenant structures and adjacent areas were photographed.
- 4) The downstream flood plain was toured to evaluate downstream development and restricting structures.

b. Dam

The concrete cap on the crest of the spillway section of the dam appeared to be severely deteriorated. It was cracked in several locations and its alignment was severely distorted due to heaving and settling. However, the concrete itself was not significantly spalled. The stone rubble dam appeared to be slightly bulged near the toe for approximately one-half of its height, mostly on the right side. However, at the time of inspections the downstream face of the dam was obscured by large quantities of ice and overflow. An accurate assessment of the cause of the apparent bulge could not be made. The ground between the left end of the dam and the upstream side

of the bridge was stabilized by a stone wall which was composed partially of stone masonry and partially of stone rubble. It appeared to be in satisfactory condition. The ground between the left side of the dam and the bridge was stabilized by an inclined concrete slab. It appeared to be generally sound and most of its surface was in generally satisfactory condition. It was somewhat spalled however at its top. Two weep holes were observed in the slab near its toe. There are two concrete buttresses constructed at the downstream toe of the dam. The steel brace on the upstream side of the culvert was resting on the concrete buttresses. The concrete surfaces of these buttresses appeared to be in satisfactory condition although they were considerably obscured by ice and overflow. It could not be determined whether the steel frame work was intended to brace the bridge or the dam.

There was one tree growing at each end of the dam on the earth embankment sections. The tree at the right end of the dam had sent roots under the concrete cap. The roots appeared to be part of the reason that the cap had heaved. The downstream face of the right embankment consisted of a stone rubble wall which was formed to be a continuation of the downstream face of the spillway section of the dam. Its condition appeared to be satisfactory.

There was extensive leakage observed in the downstream face of the dam. Two or three prominent leaks were discharging water through the dam immediately below the concrete cap. Also additional leaks were observed near the center of the dam about two feet above the toe of dam. However, the extent of leakage was obscured by the ice and overflow on the downstream side.

c. Culvert

Both sections of the culvert appeared to be founded on bedrock. There was a structural steel frame on the upstream and downstream ends of the culvert with four tie rods holding the two steel frames together. Two of the tie rods were at the top near the roadway and two ran through the upper portion of the culvert. The steel framework was composed of I-beams and angles. The condition of the steel on the downstream end appeared to be sound; however, it was rusted and contained significant scaling. The tie rods that run through the culvert were severely rusted and scaled. They appeared to be 1 inch in diameter. The condition of the stone masonry and the concrete on the inside of the culvert appeared to be in satisfactory condition. The condition of the concrete at the downstream end of the culvert forming wingwalls appeared to be generally in satisfactory condition, with the exception of the concrete forming that portion of the wall directly above the discharge end of the culvert. That concrete was severely spalled and at one location was spalled to a depth of approximately 4 inches. That was also the area where the steel frame was in position. Steel guard rails ran along the top of the culvert and appeared to be in satisfactory condition.

d. Reservoir Area

The reservoir appeared to be wooded around its entire perimeter. It had banks with about 50 to 100 percent slope. For a portion of the upstream end of the lake, a flat area containing reed grass formed the shore of the lake.

e. Downstream Channel

The downstream channel in the immediate vicinity of the dam consisted of a natural stream with a shale ledge rock bed. It had steep banks on both sides which were wooded. The terrain

surrounding the channel resembled a gorge or glen. The channel was generally free of significant obstructions.

Significant soil erosion was observed on the right bank within 100 feet of the culvert.

A dwelling was located adjacent to the channel approximately 500 feet from the dam. Road bridges were noted at locations 2200 feet, 3500 feet and 6500 feet from the dam.

A small breached dam was located about 400 feet from the dam.

SECTION 4: OPERATIONAL PROCEDURES

4.1 Procedures

The level of water in the impoundment of Headleys Pond Dam is regulated by discharge over the concrete spillway.

No evidence of low level outlet or operating facilities was observed at the times of inspection.

4.2 Maintenance of the Dam

It appears that no maintenance has been performed on the dam in recent years. According to Sussex County personnel, repairs or maintenance have not been performed on the dam in recent years.

4.3 Maintenance of Operating Facilities

No outlet works exist and no maintenance appears to have been performed on any appurtenances. The road and culvert immediately downstream from the dam is maintained by the county and for the purpose of this report, is not considered an appurtenant structure.

4.4. Description of Warning System

Reportedly, no warning system is currently in use for the dam.

4.5 Evaluation of Operational Adequacy

The operation of the dam has not been successful to the extent that the dam reportedly overtopped during the flood of August 1955.

Maintenance documentation is poor and areas of maintenance that have not been adequately performed are:

- 1) Deteriorated concrete cap forming spillway crest not repaired.
- 2) Trees on embankments not removed.
- 3) Leakage in spillway section not corrected.

SECTION 5: HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. Design Data

The quantity of storm water runoff that the spillway should be able to handle is based on the size and hazard classification of the dam. This runoff quantity, called the spillway design flood (SDF), is described in terms of return frequency or probable maximum flood (PMF) depending on the extent of the dam's size and potential hazard. According to the "Recommended Guidelines for Safety Inspection of Dams" published by the U.S. Army Corps of Engineers, the SDF for Headleys Pond Dam falls in a range of 100-year frequency to 1/2 PMF. In this case, the low end of the range, 100-year frequency, is chosen since the factors used to select size and hazard classification are on the low side of their respective ranges.

The SDF peak computed for Headleys Pond Dam is 1566 c.f.s. This value is derived from the 100-year flood hydrograph computed by the use of the HEC-1-DAM Flood Hydrograph Computer Program using the Soil Conservation Service triangular unit hydrograph with curvilinear transformation. Hydrologic computations and computer output are contained in Appendix 4.

The spillway discharge rates were computed by the use of a weir formula appropriate for a broad crested weir. The total spillway discharge with lake level equal to the top of the dam was computed to be 194 c.f.s. The SDF was routed through the dam by use of the HEC-1-DAM computer program using the modified Puls Method. In routing the SDF, it was found that the dam crest would be overtopped by a depth of 3.5 feet. Accordingly, the subject spillway is assessed as being inadequate in accordance with criteria developed by the U.S. Army Corps of Engineers.

A dam breach analysis was then performed using a trapezoidal breach section with bottom length of 25 feet and sideslopes of 1 horizontal to 1 vertical. The breach peak outflow was computed to be 3178 c.f.s. Dam breach computations are contained in Appendix 4.

The breach analysis indicates that dam failure from overtopping would not cause inundation of the dwelling located approximately 500 feet from the dam. A section of Route 614 located 2700 feet downstream would be inundated by approximately 2.5 feet

b. Experience Data

Reportedly, the dam has been overtopped only once since its construction. That overtopping was during the flood of August 1955 which damaged the Route 614 bridge immediately downstream from the dam, necessitating the bridge repair and widening of 1956.

According to correspondence in the files of the Sussex County Engineering Department, a resident observed flow 6 feet deep through the culvert during the 1955 storm.

Also the County Engineer stated in 1956 that no visible damage was sustained by the roadway due to erosion by any water overtopping the roadway.

c. Visual Observation

No evidence was found at the time of inspection that would indicate that the dam had been overtopped.

d. Overtopping Potential

As indicated in paragraph 5.1.a. a storm of magnitude equal to the SDF would cause overtopping of the dam to a height of 3.5 feet over the crest of the dam. The spillway is capable of passing approximately 12 percent of the SDF with the lake level equal to the top of dam.

e. Drawdown Time

No visible outlet works was observed. Drawdown of the lake cannot be accomplished due to the apparent absence of drawdown facilities.

SECTION 6: STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

The dam appeared, at the time of inspection, to be outwardly structurally sound. However, evidence of possible distress was observed at the times of inspection. As indicated in Section 3.1.b, the stone rubble downstream face of the dam appeared to be slightly bulged near the toe for approximately one-half the height of the dam mostly on the right side. In addition, leakage was observed actively discharging through the downstream face of the dam at several locations.

An accurate assessment of the severity of the observed indications of possible distress cannot be made without further investigation beyond the scope of a Phase I inspection.

b. Generalized Soils Description

The generalized soils description for Headleys Pond Dam consists of glacial stratified drift deposited by melt waters flowing from the Wisconsin glacier overlying slate and shale bedrock of Ordovician age. The stratified drift is composed of assorted, relatively homogeneous materials consisting predominantly of sand and gravel with some silt and clay in depressions. Depth to bedrock is usually greater than 10 feet, although outcrops were observed in the downstream channel.

c. Design and Construction Data

Analysis of structural stability and construction data for the embankment are not available.

d. Operating Records

No operating records are available for the dam. The water level of the impoundment of Headleys Pond Dam is not monitored.

e. Post-Construction Changes

The apparent major post-construction change was the addition of steel bracing to the culvert and the supporting of the bracing by concrete buttresses at the toe of dam.

Reportedly, the steel brace is designed to support both the culvert and the dam. However, design calculations are not available.

f. Seismic Stability

Headleys Pond Dam is located in Seismic Zone 1 as defined in "Recommended Guidelines for Safety Inspection of Dams" which is a zone of very low seismic activity. Experience indicates that dams in Seismic Zone 1 will have adequate stability under seismic loading conditions if they have adequate stability under static loading conditions. Headleys Pond Dam appeared at the times of inspection to be outwardly stable.

SECTION 7: ASSESSMENT AND RECOMMENDATIONS

7.1 Dam Assessment

a. Safety

Based on hydraulic and hydrologic analyses outlined in Section 5 and Appendix 4, the spillway of Headleys Pond Dam is assessed as being inadequate. The spillway is not able to pass the SDF without an overtopping of the dam.

The crest and downstream face of the dam appeared, at the time of inspection, to be generally outwardly stable as indicated in Section 6.1.a. However, observed leakage and bulging of the spillway structure are considered to be evidence of possible future dam instability.

b. Adequacy of Information

Information sources for this report include 1) field inspection, 2) USGS quadrangle, 3) plans and correspondence on file at the Sussex County Engineering Department and 4) consultation with personnel of the the Sussex County Engineering Department. The information obtained is sufficient to allow a Phase I assessment as outlined in "Recommended Guidelines for Safety Inspection of Dams."

Some of the absent data are as follows:

1. Construction drawings.
2. Description of fill material for embankment.
3. Design computations and reports.
4. Soils report for the site.
5. Maintenance documentation.
6. Post-construction engineering reports.

c. Necessity for Additional Data/Evaluation

Additional data and evaluation are considered necessary in order to assess the structural integrity of the dam.

7.2 Recommendations

a. Remedial Measures

Based on hydraulic and hydrologic analyses outlined in paragraph 5.1.a, the spillway is considered to be inadequate. It is therefore recommended that a professional engineer experienced in the design and construction of dams be engaged in the near future to perform more accurate hydraulic and hydrologic analyses relating to spillway capacity. Based on the findings of these analyses, the need for and type of remedial measures should be determined and then implemented.

The owner should, in the near future, develop an emergency action plan together with an effective warning system outlining actions to be taken by the operator to minimize downstream effects of an emergency at the dam.

In addition, it is recommended that the following remedial measures be undertaken by the owner in the near future.

- 1) The ability to drain the lake should be investigated by an engineer experienced in the design and construction of dams. If the need for a low level outlet is determined, a suitable outlet should be designed and installed.
- 2) The stone rubble portion of the dam should be thoroughly inspected by a professional engineer experienced in the design and construction of dams. The dam should be inspected with the lake drawn down and with the lake

filled. Based on the inspections, together with any necessary subsoil, seepage and structural investigations, remedial measures to correct the leakage and other possible causes of distress should be determined and then implemented.

- 3) Concrete cap and abutments forming spillway crest should be reconstructed.
- 4) Trees and other adverse vegetation on the embankments should be removed.

b. Maintenance

In the future, the owner of the dam should develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam.

PLATES

HEADLEYS POND DAM

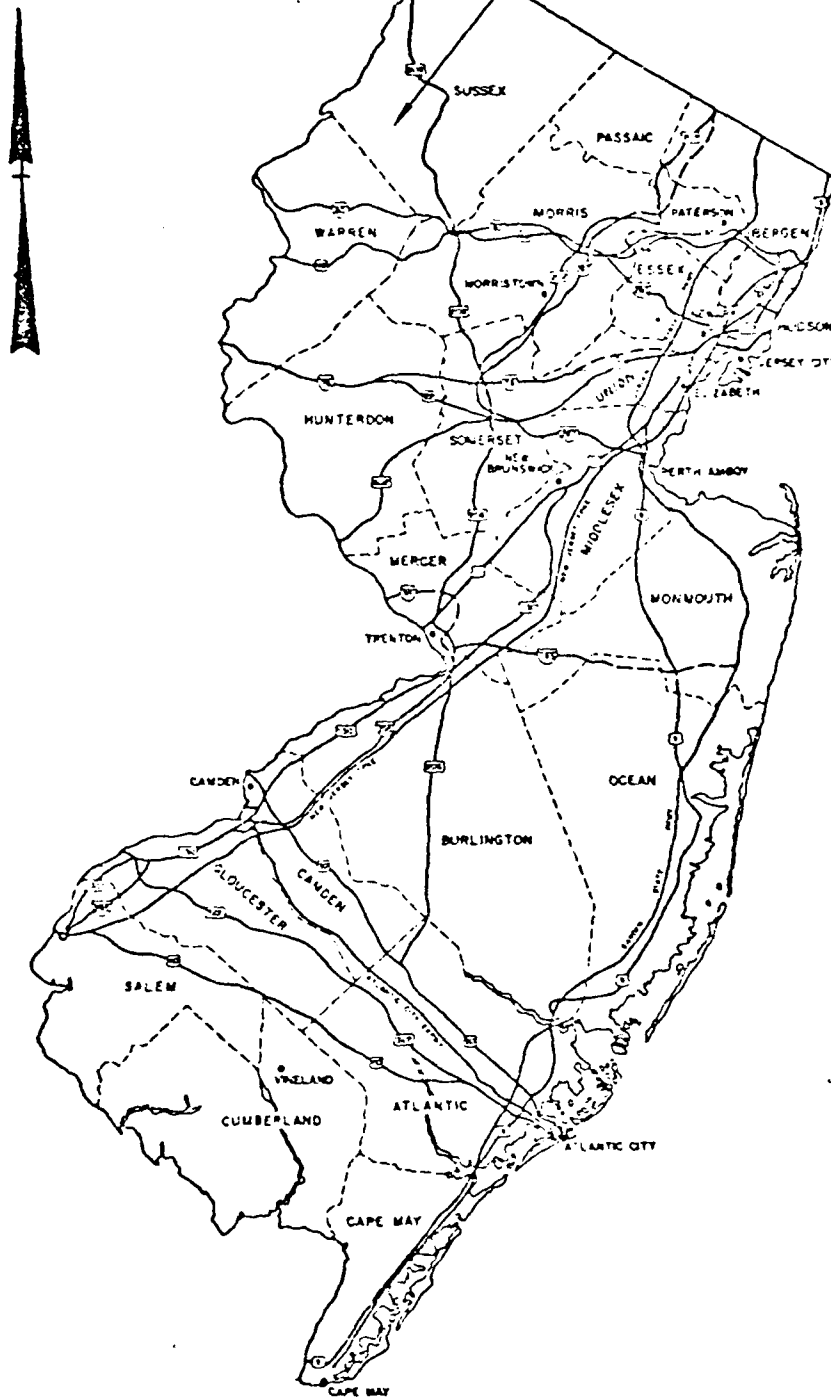


PLATE 1

STORCH ENGINEERS
FLORHAM PARK, NEW JERSEY

DIVISION OF WATER RESOURCES
N.J. DEPT. OF ENVIR. PROTECTION
TRENTON, NEW JERSEY

INSPECTION AND EVALUATION OF DAMS

KEY MAP

HEADLEYS POND DAM

SCALE: NONE

DATE: FEB. 1981

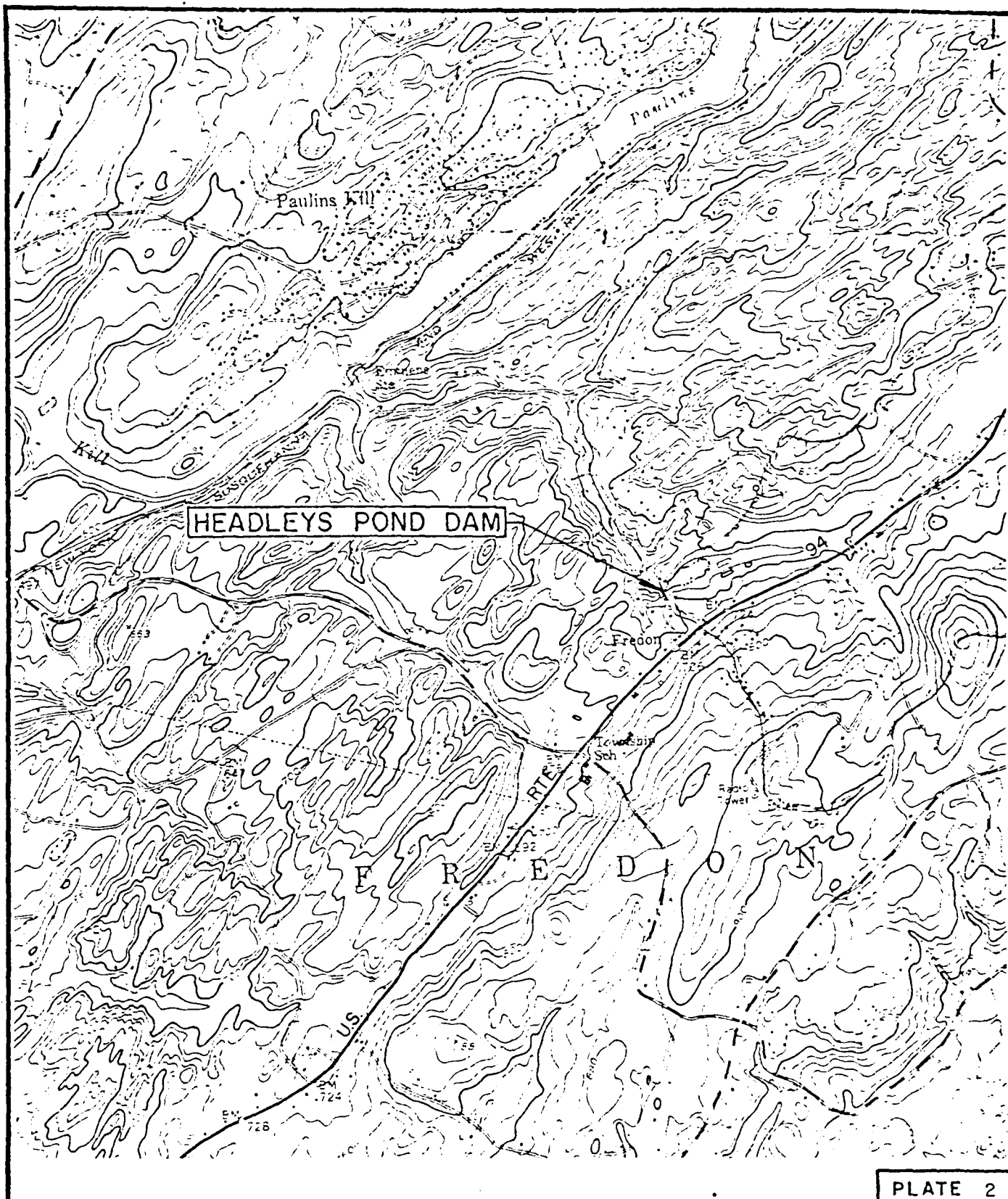


PLATE 2

STORCH ENGINEERS
FLORHAM PARK, NEW JERSEY

DIVISION OF WATER RESOURCES
N.J. DEPT. OF ENVIR PROTECTION
TRENTON, NEW JERSEY

INSPECTION AND EVALUATION OF DAMS

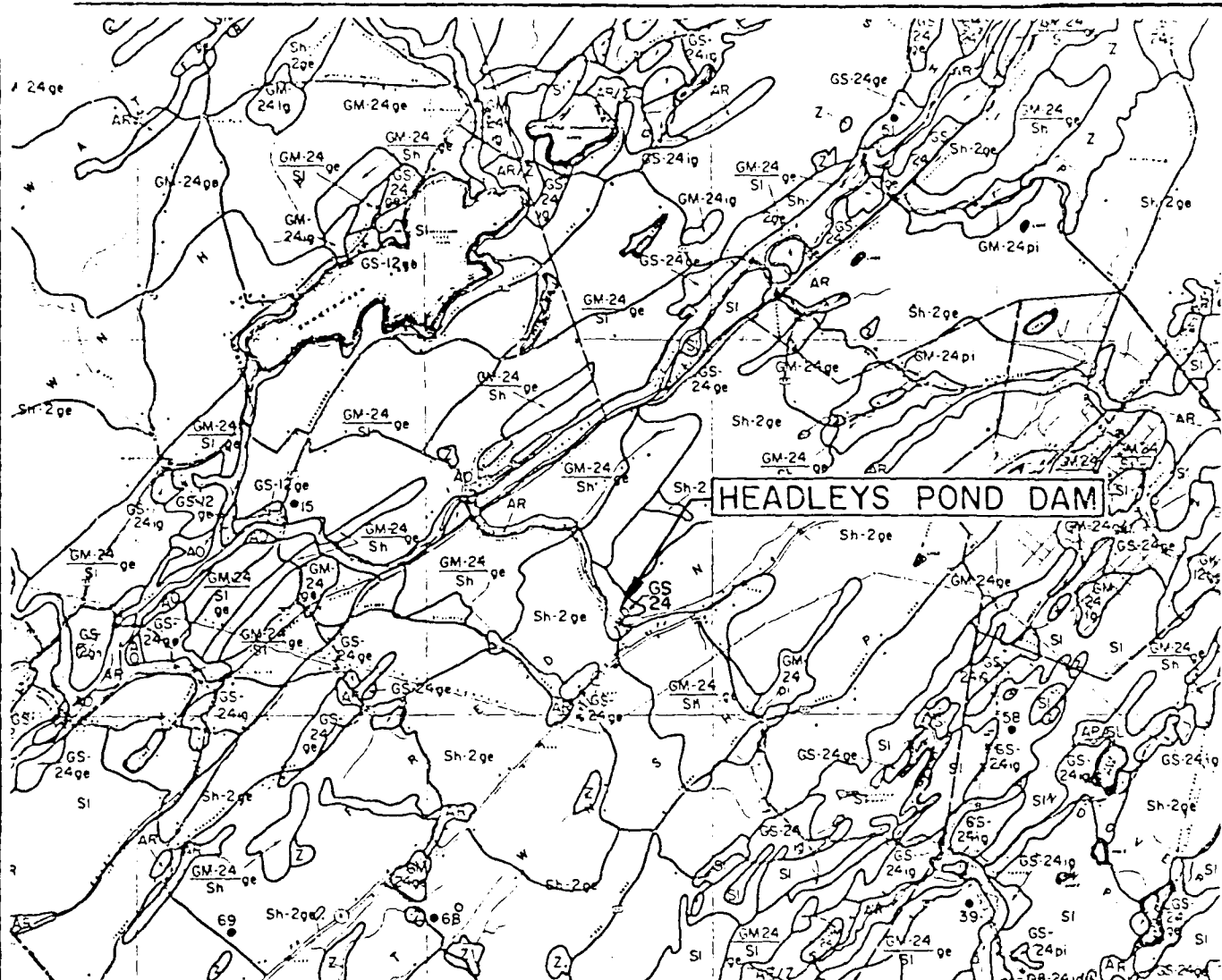
VICINITY MAP

HEADLEYS POND DAM

I.D. N.J. 00790

SCALE: NONE

DATE: MARCH, 1981



Legend

GS-24 Glacial stratified drift deposited by melt waters flowing from the Wisconsin glacier.

Sh-2 Slate and shale bedrock of Ordovician age. Shown as Martinsburg shale on the Geologic Map of New Jersey.

Note: Information taken from Rutgers University, Soil Survey of New Jersey, Report No. 11, Sussex County, January 1961. Geologic Map of New Jersey prepared by J.V. Lewis and H. Kummel 1910-1912, revised by H.B. Kummel 1931 and M. Johnson 1950.

PLATE 3

STORCH ENGINEERS
FLORHAM PARK, NEW JERSEY.

DIVISION OF WATER RESOURCES
N.J. DEPT. OF ENVIR. PROTECTION
TRENTON, NEW JERSEY

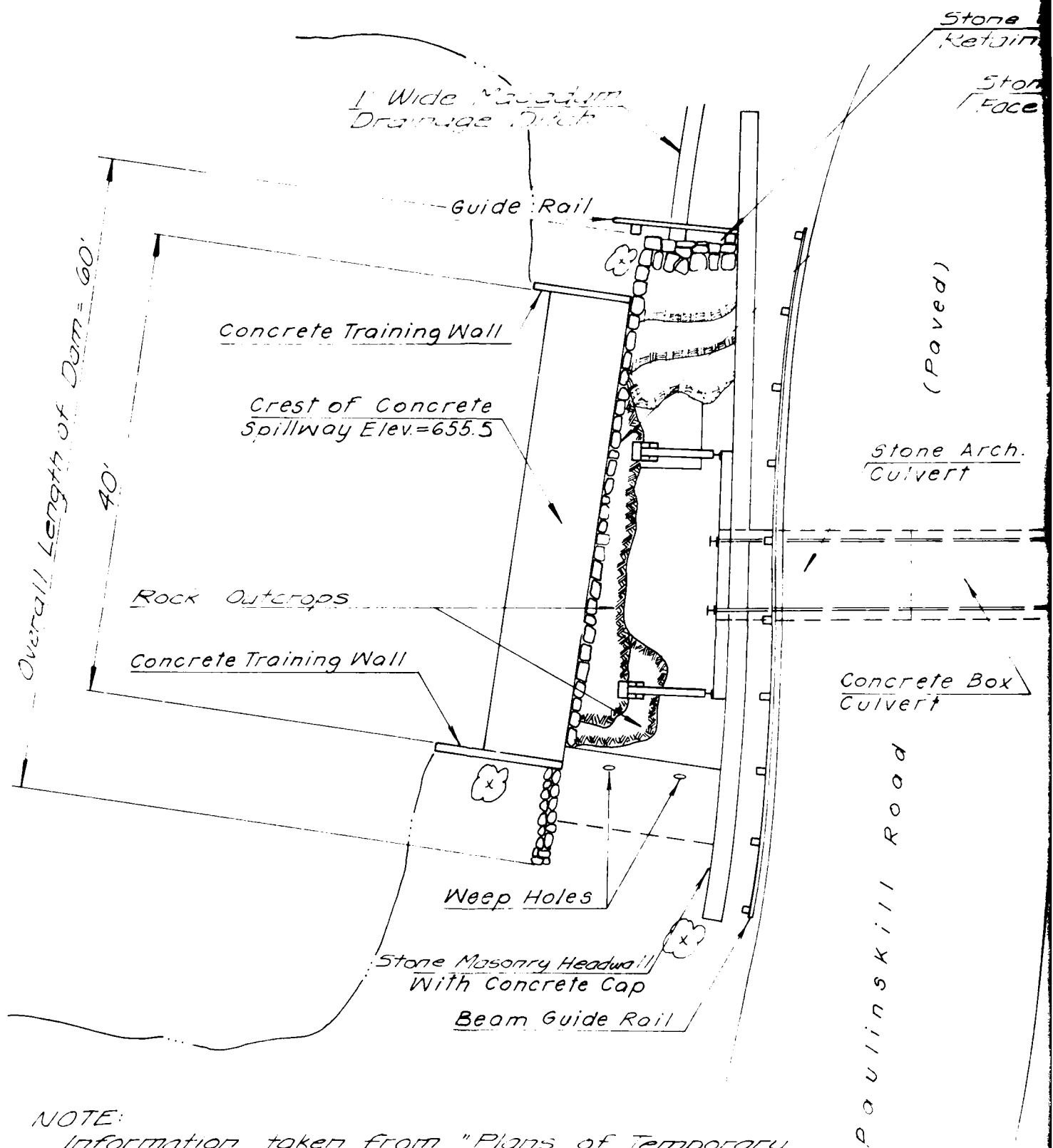
INSPECTION AND EVALUATION OF DAMS

SOIL MAP
HEADLEYS POND DAM

I.D.N.J. 00790

SCALE NONE

DATE MARCH 1981



NOTE:

Information taken from "Plans of Temporary Repairs to Bridge No 40" dated Nov 1968, "Plans of Proposed Reconstruction of Bridge No 40" 1956 and field inspections December 30, 1980 and March 1, 1981.

Stone Rubble & Concrete
Retaining Wall

Stone Rubble Downstream
Face of Spillway & Embankment

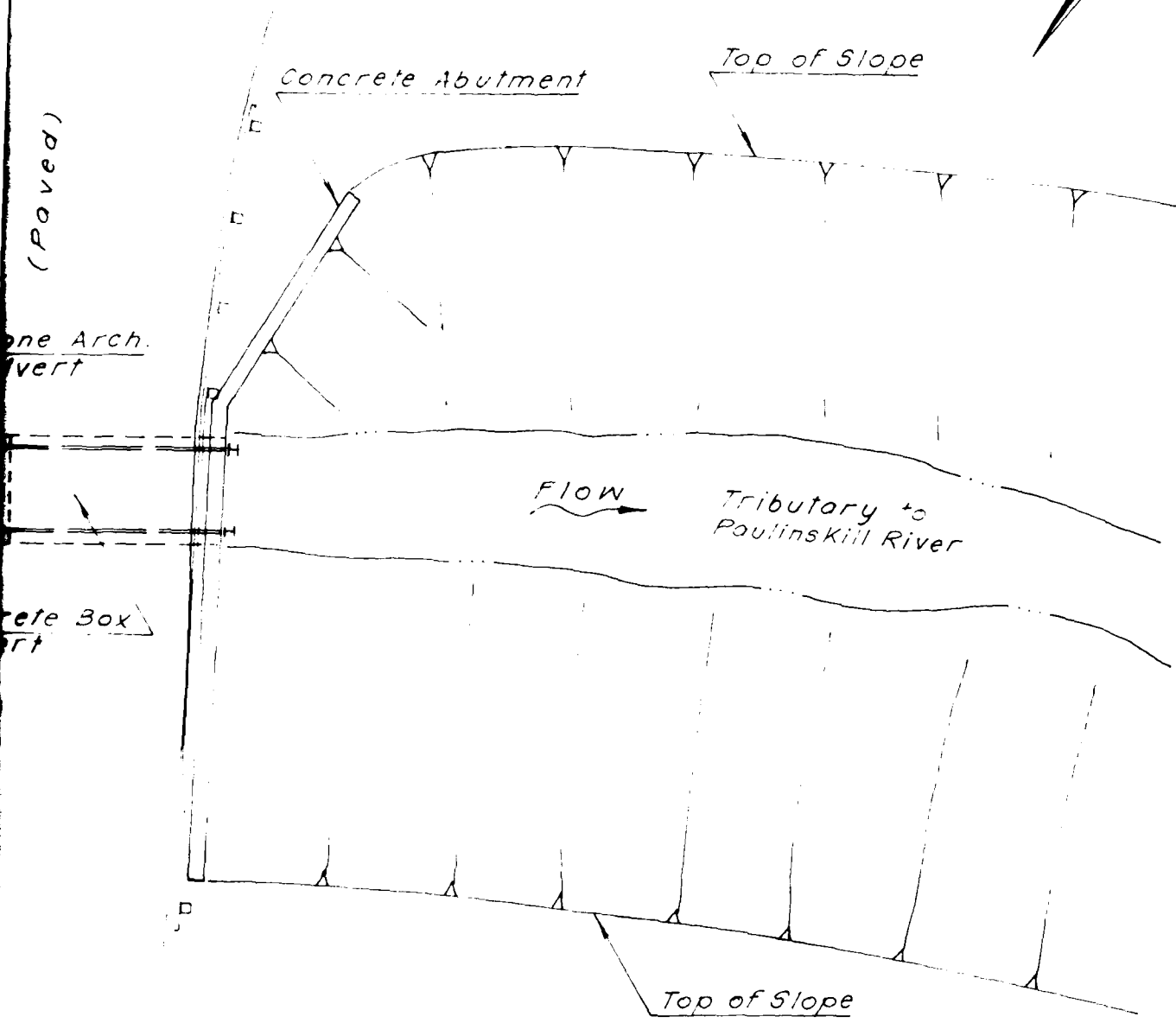
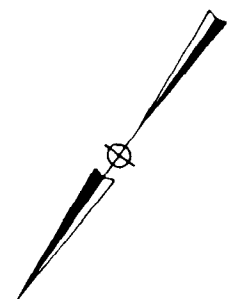
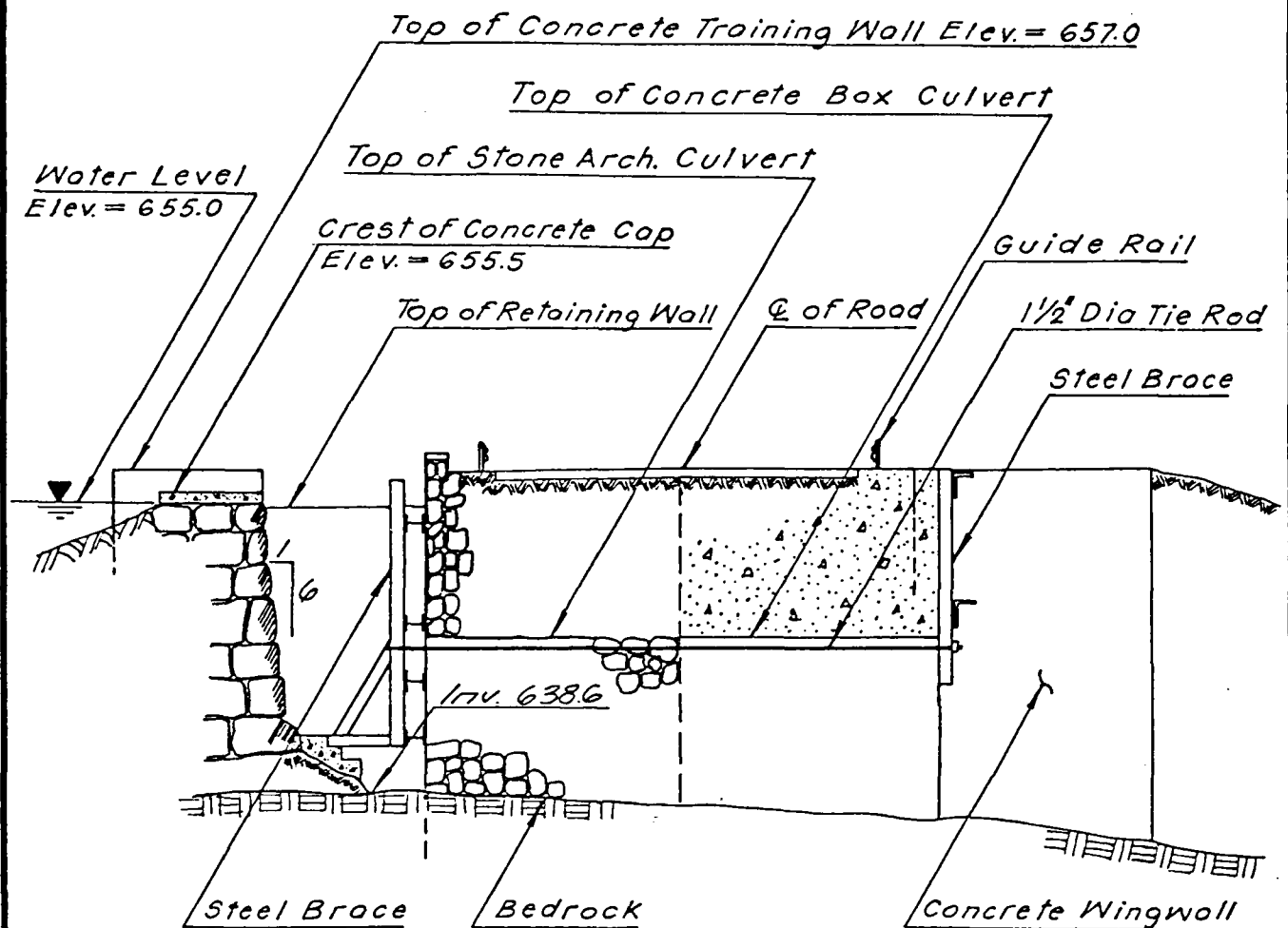


PLATE 4

STORCH ENGINEERS FLORHAM PARK, NEW JERSEY	DIVISION OF WATER RESOURCES N.J. DEPT. OF ENVIR. PROTECTION TRENTON, NEW JERSEY
INSPECTION AND EVALUATION OF DAMS PLAN HEADLEYS POND DAM	
I.D.N.J. 00790	SCALE: NOT TO SCALE
	DATE: MARCH 1981



SPILLWAY SECTION

PLATE 5

STORCH ENGINEERS
FLORHAM PARK, NEW JERSEY

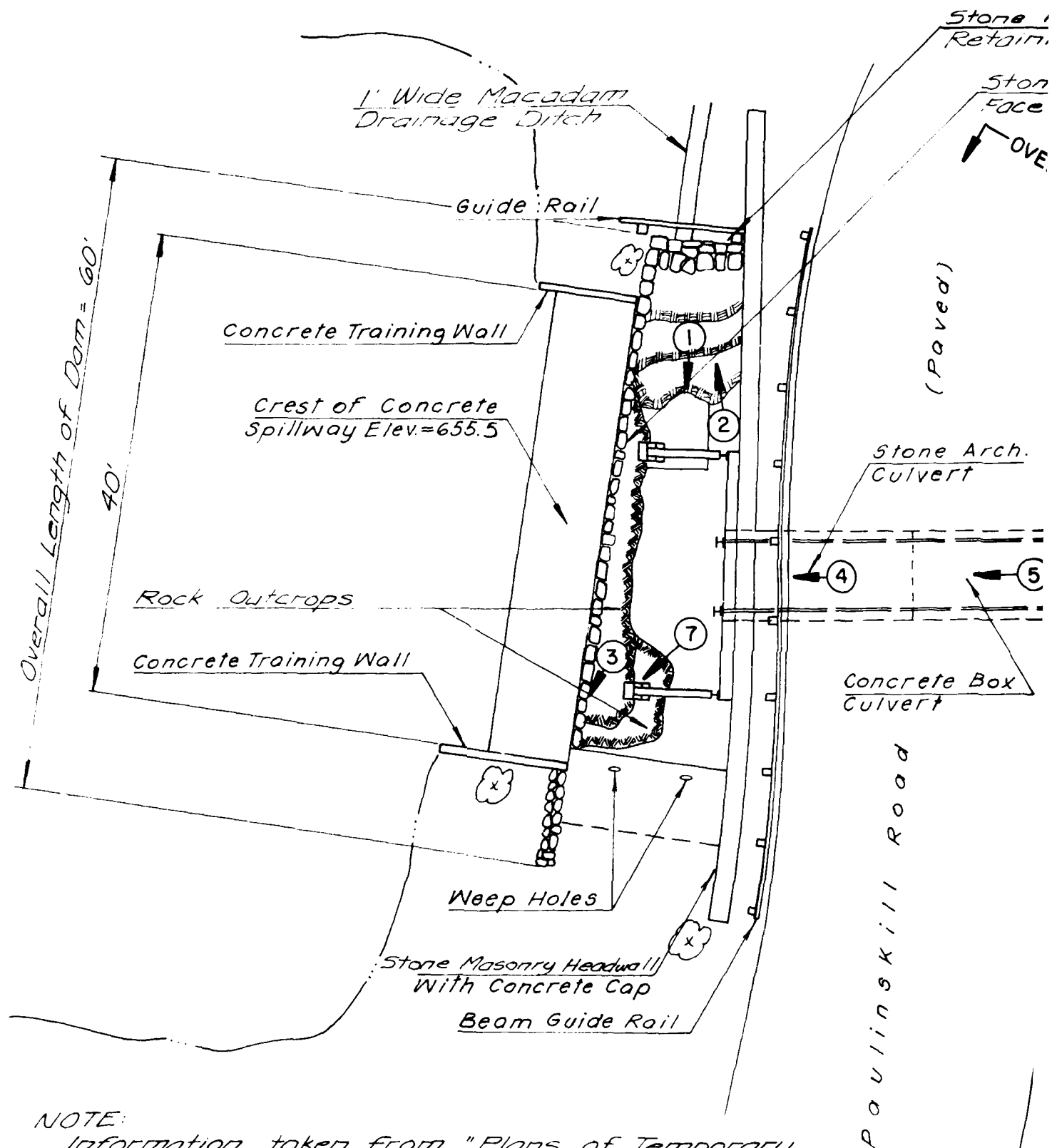
DIVISION OF WATER RESOURCES
N.J. DEPT. OF ENVIR. PROTECTION
TRENTON, NEW JERSEY

INSPECTION AND EVALUATION OF DAMS
SPILLWAY SECTION
HEADLEYS POND DAM

I.D.N.J. 00790

SCALE: NONE

DATE: MARCH 1981



NOTE:

Information taken from "Plans of Temporary Repairs to Bridge No. 40" dated Nov 1968, "Plans of Proposed Reconstruction of Bridge No. 40," 1956 and field inspections December 30, 1980 and March 1, 1981.

Stone Rubble & Concrete
Retaining Wall

Stone Rubble Downstream
Face of Spillway & Embankment

OVERVIEW

Concrete Abutment

Top of Slope

(Paved)

one Arch.
Invert

5

8

FLOW

Tributary to
Paulinskill River

crete Box
Invert

6

Top of Slope

PLATE 6

STORCH ENGINEERS
FLORHAM PARK, NEW JERSEY

DIVISION OF WATER RESOURCES
N.J. DEPT. OF ENVIR. PROTECTION
TRENTON, NEW JERSEY

INSPECTION AND EVALUATION OF DAMS
PHOTO LOCATION PLAN
HEADLEYS POND DAM

I.D.N.J. 00790

SCALE: NOT TO SCALE

DATE: MARCH 1981

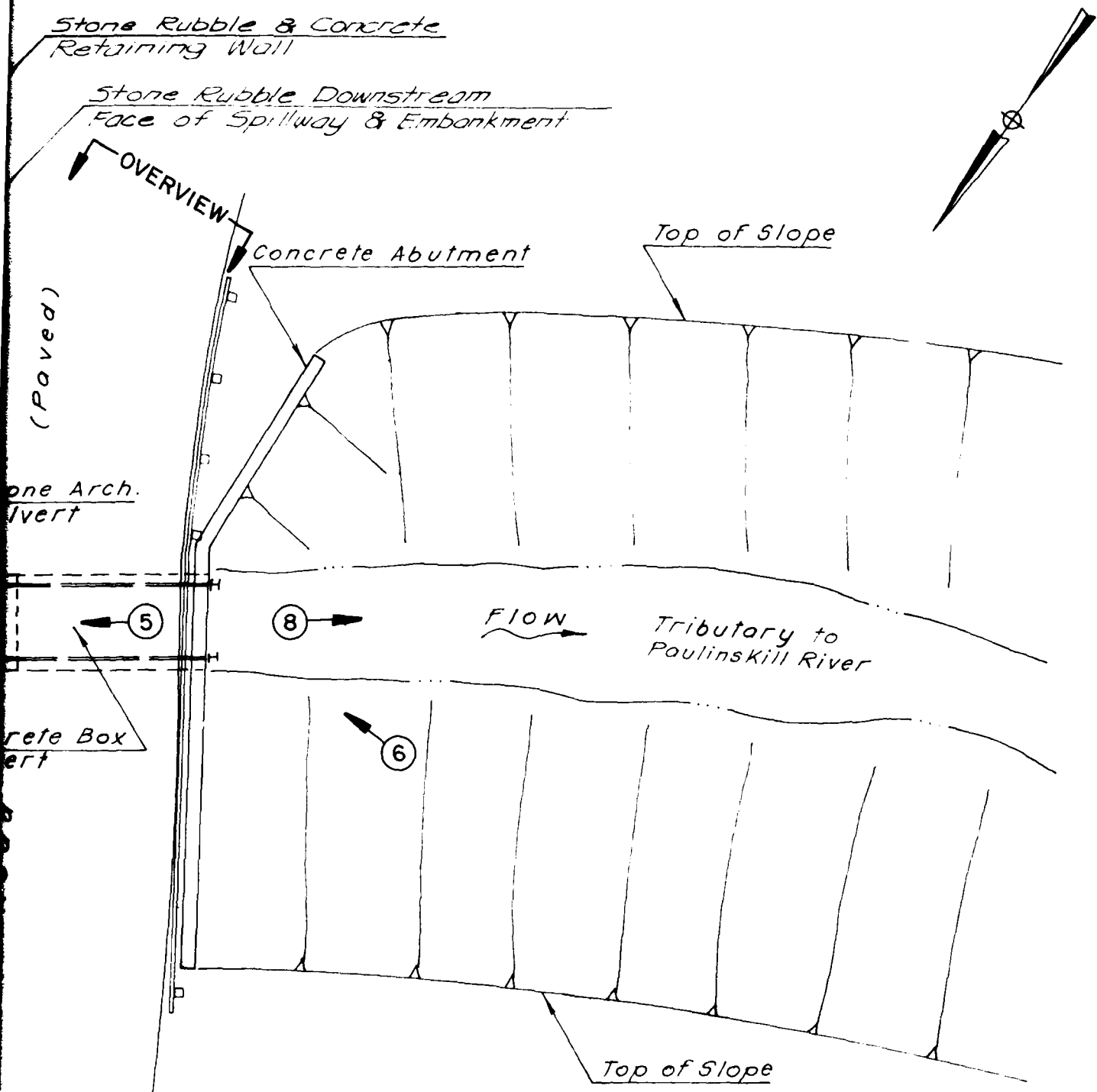


PLATE 6

STORCH ENGINEERS
FLORHAM PARK, NEW JERSEY

DIVISION OF WATER RESOURCES
N.J. DEPT. OF ENVIR. PROTECTION
TRENTON, NEW JERSEY

INSPECTION AND EVALUATION OF DAMS
PHOTO LOCATION PLAN
HEADLEYS POND DAM

I.D. N.J. 00790

SCALE: NOT TO SCALE

DATE: MARCH 1981

APPENDIX 1

Check List - Visual Inspection

Check List - Engineering Data

Check List

Visual Inspection

Phase I

Name of Dam Headleys Pond Dam County Sussex State N.J. Coordinators NJDEP

Date(s) Inspection 12/30/80 Weather Sunny Temperature 30°F
3/1/81

Pool Elevation at time of Inspection 655.0 M.S.L. Tailwater at Time of Inspection 639.0 M.S.L.

Inspection Personnel:

<u>John Gribbin</u>	<u>Mark Brady</u>
<u>Charles Osterkorn</u>	<u>Richard McDermott</u>
<u>Daniel Buckelew</u>	

John Gribbin Recorder

Owners Representative not present

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
GENERAL	Stone rubble downstream face slightly bulged near toe for about one-half its height, mostly on right side.	Downstream face obscured by ice and overflow. Structural stability of dam should be investigated.
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	Appeared sound.	
DRAINS	Two weep holes observed in conc. slab slope stabilization between right end of dam and road embankment. No evidence of discharge observed.	
WATER PASSAGES	None observed	
APRON	None observed. Could not be properly assessed due to accumulation of ice and overflow.	
VERTICAL AND HORIZONTAL ALIGNMENT	Verticle: Irregular due to deteriorated condition of conc. cap. Horizontal: Straight	

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	Concrete cap broken (See Spillway)	
STRUCTURAL CRACKING	No cracking observed.	
CONSTRUCTION JOINTS	N.A.	
MONOLITH JOINTS	N.A.	
LEAKAGE	Leakage was observed in two or three prominent areas located immediately below the concrete cap and additional leaks were observed at various heights above the toe of the dam.	Leakage should be investigated to determine magnitude and effects on dam stability.
SEEPAGE	None observed but could not be assessed properly due to accumulation of ice and overflow.	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
GENERAL	Trees observed on both right and left embankments adjacent to the spillway and the roots appeared to have dislodged a portion of the spillway cap.	Trees and adverse vegetation should be removed.
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Appeared sound. Stone rubble downstream face of spillway section continues across junctions to form downstream faces of embankments.	
ANY NOTICEABLE SEEPAGE	None observed (See Seepage, Concrete/Masonry Dams)	
STAFF GAGE AND RECORDER	None observed	
DRAINS	Two weep holes observed (See Concrete/Masonry Dams.)	

EMBANKMENT

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None observed	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	Slight bulge in downstream face. (See Concrete/Masonry Dams.)	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	None observed	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Vertical: Level Horizontal: Generally Straight	
RIPRAP	None observed. Earth slopes between ends of embankments and road embankment stabilized by conc. slab on right and stone rubble and conc. wall on left. Stabilization appeared sound with surface deterioration noted.	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SURFACES IN OUTLET CONDUIT	None	
INTAKE STRUCTURE	None	
OUTLET STRUCTURE	None	
OUTLET CHANNEL	None	
GATE AND GATE HOUSING	None	

SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
WEIR	Concrete cap forming spillway crest cracked in several locations; alignment severely distorted due to heaving and settling.	Concrete cap should be completely reconstructed.
ABUTMENTS	Concrete abutments adjacent to spillway crest cracked and settled.	Concrete abutments should be reconstructed.
DISCHARGE CHANNEL	Area between dam and culvert forms a splash chamber or stilling basin. Discharge channel formed by culvert.	
CULVERT	Combination stone masonry arch and conc. box culvert forms discharge channel. Structure reconstructed in 1956, appeared to be sound.	Culvert is designated as Sussex County Bridge No. 40. Conc. box section added to downstream end of culvert in 1956.

INSTRUMENTATION

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	Two U.S.G.S. monuments located within 1000' of dam on Route 94.	
OBSERVATION WELLS	None	
WEIRS	None	
PIEZOMETERS	None	
OTHER	None	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Shores wooded with slopes ranging from 50% to 100%. Flat area containing reed grass located at upstream end of lake.	
SEDIMENTATION	Unknown	
STRUCTURES ALONG BANKS	None observed.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTION, DEBRIS, ETC.)	Within 200' of dam, natural stream with bed consisting of shale outcrops. No significant obstructions observed.	
SLOPES	Stream gradient steep in vicinity of dam. Banks wooded and high, resembling a gorge or glen.	
STRUCTURES ALONG BANKS	County road bridges located 2200', 3500', and 6500' downstream. Dwelling adjacent to channel located 500' downstream, approx. 8' above stream bed.	

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM	REMARKS
DAM - PLAN	
SECTIONS	"Plans of Proposed Reconstruction of Bridge No. 40", dated 1956, prepared by George Harper, County Engineer, c/o Sussex County Engineering Department, P.O. Box 63, Newton, N.J. 07860.
SPILLWAY - PLAN	
SECTIONS	"Plans of Proposed Reconstruction of Bridge No. 40, dated 1956."
DETAILS	
OPERATING EQUIPMENT PLANS & DETAILS	Not Available
OUTLETS - PLAN	
DETAILS	Not Available
CONSTRAINTS	
DISCHARGE RATINGS	
HYDRAULIC/HYDROLOGIC DATA	Not Available
RAINFALL/RESERVOIR RECORDS	Not Available
CONSTRUCTION HISTORY	Not Available
LOCATION MAP	Not Available

ITEM	REMARKS
DESIGN REPORTS	Not available
GEOLOGY REPORTS	Not available
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM INSTABILITY SEEPAGE STUDIES	Not available
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	Not available
POST-CONSTRUCTION SURVEYS OF DAM	Not available
BORROW SOURCES	Not available

ITEM

REMARKS

MONITORING SYSTEMS

Not available

MODIFICATIONS

"Plans of Temporary Repairs to Bridge No. 40" prepared by Calman Ambros, County Engineer, dated November 1968.

HIGH POOL RECORDS

Reportedly downstream Bridge No. 40 (Arch-Culvert) ran with a head of 6 feet during the flood of August 1955, correspondence available in files of Sussex County Engineering Dept.

POST CONSTRUCTION ENGINEERING
STUDIES AND REPORTS

Not available

PRIOR ACCIDENTS OR FAILURE OF DAM
DESCRIPTION
REPORTS

Reportedly, dam overtopped during flood of August 1955, Correspondence available in files of Sussex County Engineering Dept.

MAINTENANCE
OPERATION
RECORDS

Not available.

APPENDIX 2

Photographs



PHOTO 1

CREST AND DOWNSTREAM FACE OF DAM
SHOWING STEEL BRACING BETWEEN CULVERT AND DAM



PHOTO 2

LEFT END OF DAM AND LEFT ABUTMENT

HEADLEYS POND DAM

30 DECEMBER 1980



PHOTO 3
RIGHT END OF CREST SHOWING LEAKAGE



PHOTO 4
DOWNSTREAM FACE OF DAM VIEWED FROM CULVERT

HEADLEYS POND DAM

30 DECEMBER 1980



PHOTO 5

CULVERT DOWNSTREAM FROM DAM SHOWING CHANGE OF SECTION



PHOTO 6

STEEL BRACE ON DOWNSTREAM END OF CULVERT

HEADLEYS POND DAM

30 DECEMBER 1980



PHOTO 7
SUPPORT FOR STEEL BRACE AT TOE OF DAM

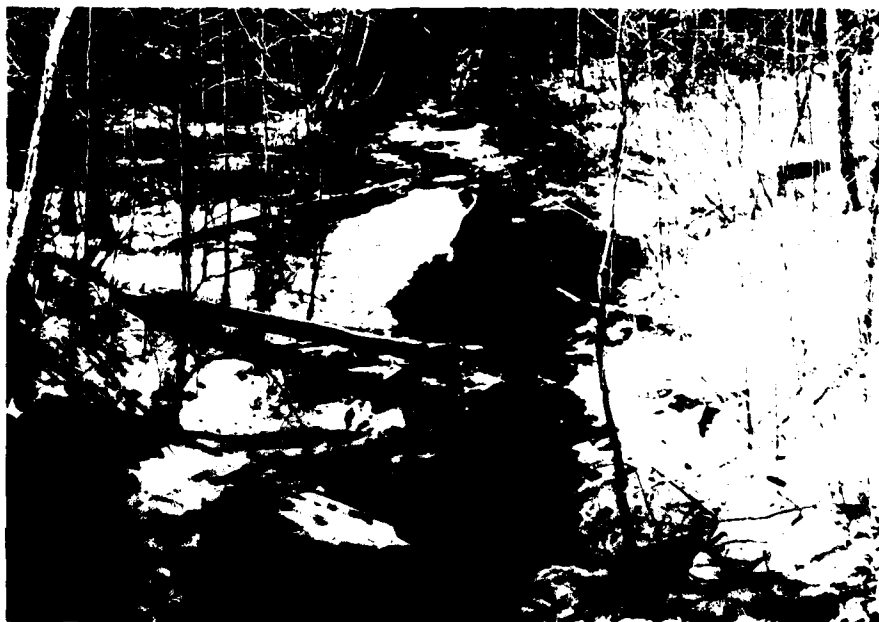


PHOTO 8
DOWNSTREAM CHANNEL

HEADLEYS POND DAM
30 DECEMBER 1980

APPENDIX 3

Engineering Data

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: Wooded & residential

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 655.0 (37 acre - feet)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): N.A.

ELEVATION MAXIMUM DESIGN POOL: 660.5

ELEVATION TOP DAM: 657.0

SPILLWAY CREST: Uncontrolled Concrete Weir

a. Elevation 655.5

b. Type Broad Crested Weir

c. Width 8.0 feet

d. Length 40.0 feet

e. Location Spillover Downstream face of dam

f. Number and Type of Gates None

OUTLET WORKS: None

a. Type N.A.

b. Location N.A.

c. Entrance Invert N.A.

d. Exit Invert N.A.

e. Emergency Draindown Facilities: None

HYDROMETEOROLOGICAL GAGES: None

a. Type N.A.

b. Location N.A.

c. Records N.A.

MAXIMUM NON-DAMAGING DISCHARGE:

(Lake Stage Equal to Top of Dam) 194 c.f.s.

APPENDIX 4

Hydraulic/Hydrologic Computations

HYDROLOGY

HYDROLOGIC ANALYSIS - RUNOFF HYDROGRAPH WILL BE DEVELOPED BY THE HEC-1-DAM COMPUTER PROGRAM

USING THE SCS METHOD WITH CURVILINEAR TRANSFORMATION

DRAINAGE AREA = 1.44 SQUARE MILES

INFILTRATION DATA

INITIAL INFILTRATION = 1.5 INCHES

CONSTANT INFILTRATION = 0.15 INCHES/HOUR

TIME OF CONCENTRATION

1) SCS - TR55

OVERLAND FLOW L = 1100'

800-745 = 55'

SLOPE = 5.0%

CHANNEL FLOW L = 9000'

745-655 = 90'

SLOPE = 1.0%

OVERLAND VELOCITY = 1.6 ft/sec.

CHANNEL VELOCITY = 1.5 ft/sec.

$$T_c = \left[\left(\frac{1100}{1.6} \right) + \left(\frac{9000}{1.5} \right) \right] \frac{1}{3600} = .19 + 1.67$$

$$T_c = \underline{\underline{1.86 \text{ hours}}}$$

TIME OF CONCENTRATION (CONT)2) BY KERBY - "HANDBOOK OF HYDROLOGY" BY CHOW

$$T_c^{2.14} = \frac{2}{3} L n / \sqrt{S}$$

where: T_c = overland time of concentration (min.)
 L = length of overland flow (ft.)
 n = Manning's coeff. ($n = 0.4$)
 S = slope (ft/ft)

$$T_c^{2.14} = \frac{2}{3} \frac{(1100)(.4)}{\sqrt{.05}} = 1311$$

$$T_c = 28.6 \text{ minutes} = 0.48 \text{ hours}$$

$$\text{TOTAL } T_c = 1.67 + 0.48 = \underline{\underline{2.15 \text{ hours}}}$$

3) DESIGN OF SMALL DAMS pg 71

$$T_c = \left(\frac{11.9 L^3}{H} \right)^{.385}$$

where:
 T_c = time of concentration (hr)
 L = length of watercourse (mi)
 H = elevation difference (feet)

$$L = 1.91 \text{ miles}$$

$$H = 145'$$

$$T_c = \left(\frac{11.9 (1.91)^3}{145} \right)^{.385} = (0.72)^{.385} = 0.81$$

$$T_c = \underline{\underline{0.81 \text{ hours}}}$$

STORCH ENGINEERS

Sheet 3 of 12

Project HEADLEY'S POND DAM

Made By CLO Date 6/16/81

Chkd By JG Date 6/16/81

TIME OF CONCENTRATION (con't)

FOR COMPUTER INPUT

LAG TIME use $t_c = 2.0$ hours

$LAG = 60\% t_c = \underline{\underline{1.2 \text{ hours}}}$

STORCH ENGINEERS

Sheet 4 of 12

Project

HEADLEY'SPOND DAM

Made By

JH

Date

2/24/81

Chkd By

JS

Date

3/10/81

24 HOURS, 100 YEAR RAINSTORM DISTRIBUTION
FOR HEATER'S POND DAM

TIME [hr]	RAIN [IN]
1	0.08
2	0.08
3	0.08
4	0.08
5	0.08
6	0.08
7	0.09
8	0.09
9	0.18
10	0.18
11	0.18
12	0.19
13	0.3
14	0.3
15	0.8
16	3.0
17	0.4
18	0.3
19	0.19
20	0.18
21	0.09
22	0.09
23	0.08
24	0.08
24 hr	Σ 7.20

FROM TP 40 U.S. NATIONAL BUREAU

STORCH ENGINEERS

Sheet 5 of 14

Project HEADLEY'S POND DAM

Made By J.D. Date 1/13/81

Chkd By JS Date 3/10/81

LAKE STORAGE VOLUME

WATER SURFACE ELEVATION

AREA (ACRES)

638.6

0

655.0

6.2

680.0

13.2

700.0

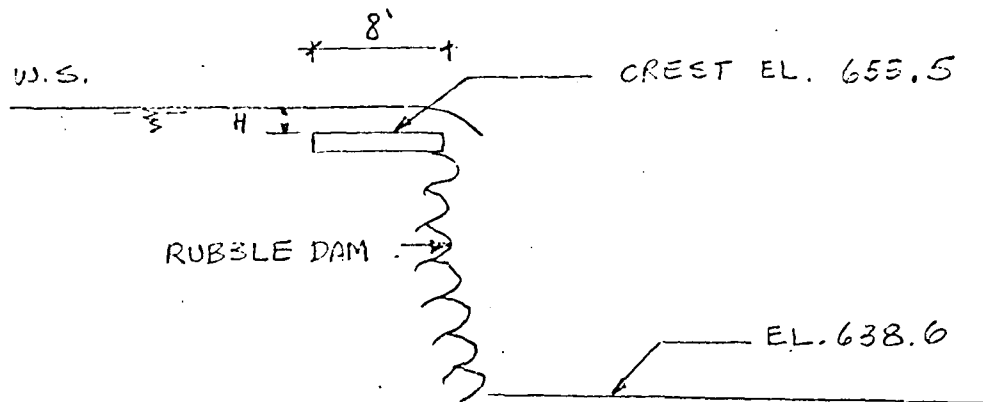
31.7

HEC-1-DAM COMPUTER PROGRAM WILL
DEVELOP STORAGE CAPACITY FROM
SURFACE AREAS AND ELEVATIONS

INFORMATION TAKEN FROM USGS NENTON,
WEST QUADRANGLE, N.J.

HYDRAULICS

THE SPILLWAY AT THE HEADLEY POND DAM
IS A. CONCRETE FREE OVERFLOW
BROAD CRESTED WEIR



THE CREST IS AT ELEVATION 655.5
WITH AN EFFECTIVE LENGTH OF 40 FEET
DISCHARGE WILL BE CALCULATED USING THE
FORMULA $Q = CLH^{3/2}$

WHERE: Q = DISCHARGE
 C = COEFFICIENT OF DISCHARGE
 L = EFFECTIVE LENGTH OF SPILLWAY
BEING OVERTOPPED
 H = TOTAL HEAD ON SPILLWAY

$C = 2.64$ FROM "HANDBOOK OF HYDRAULICS"
KEEFE AND LUTER

STORCH ENGINEERS

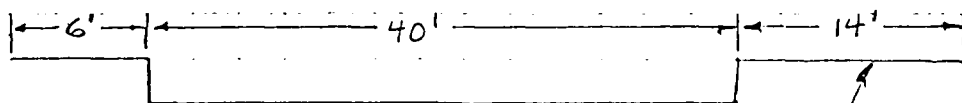
Sheet 7 of 12Project HEADLEY'S POND DAMMade By CLO Date 2/23/81Chkd By JG Date 3/10/81

SPILLWAY STAGE DISCHARGE TABULATION

WATER SURFACE ELEVATION	H (feet)	Q (cfs)
655.0	0	0
655.5	0	0
656.0	0.5	37
656.5	1.0	106
657.0	1.5	194
658.0	2.5	417
659.0	3.5	691
660.0	4.5	1008
661.0	5.5	1362

$$Q = 2.64 L H^{3/2}$$

$$L = 40'$$



TOP OF DAM
ELEVATION 657.0

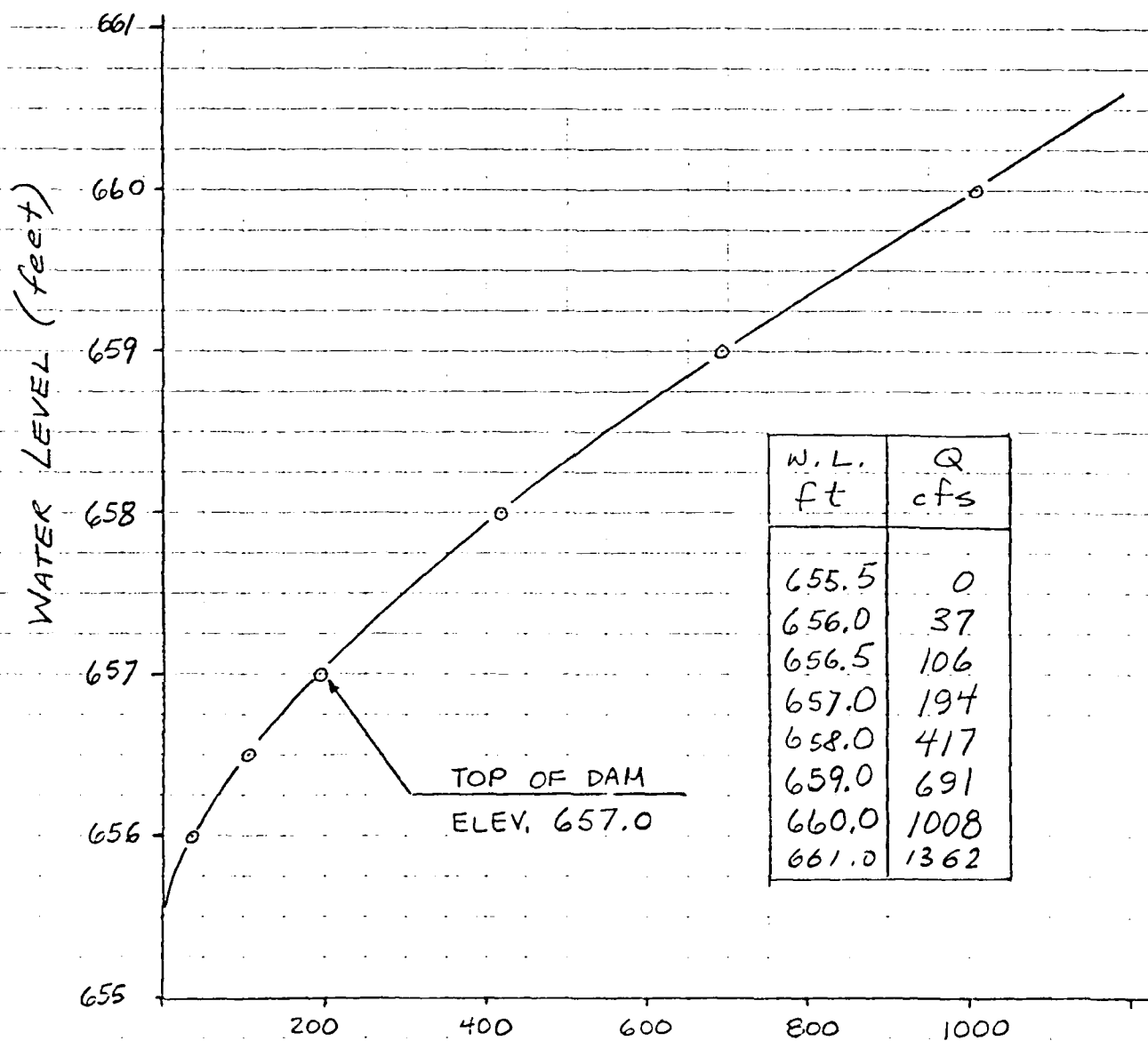
SPILLWAY CREST
ELEVATION 655.5

TOTAL LENGTH OF DAM = 60'

STORCH ENGINEERS

Project HEADLEY'S POND DAMSheet 8 of 12Made By CLO Date 2/23/81Chkd By JG Date 3/10/81

SPILLWAY STAGE DISCHARGE CURVE



Q (c.f.s.)

STORCH ENGINEERS

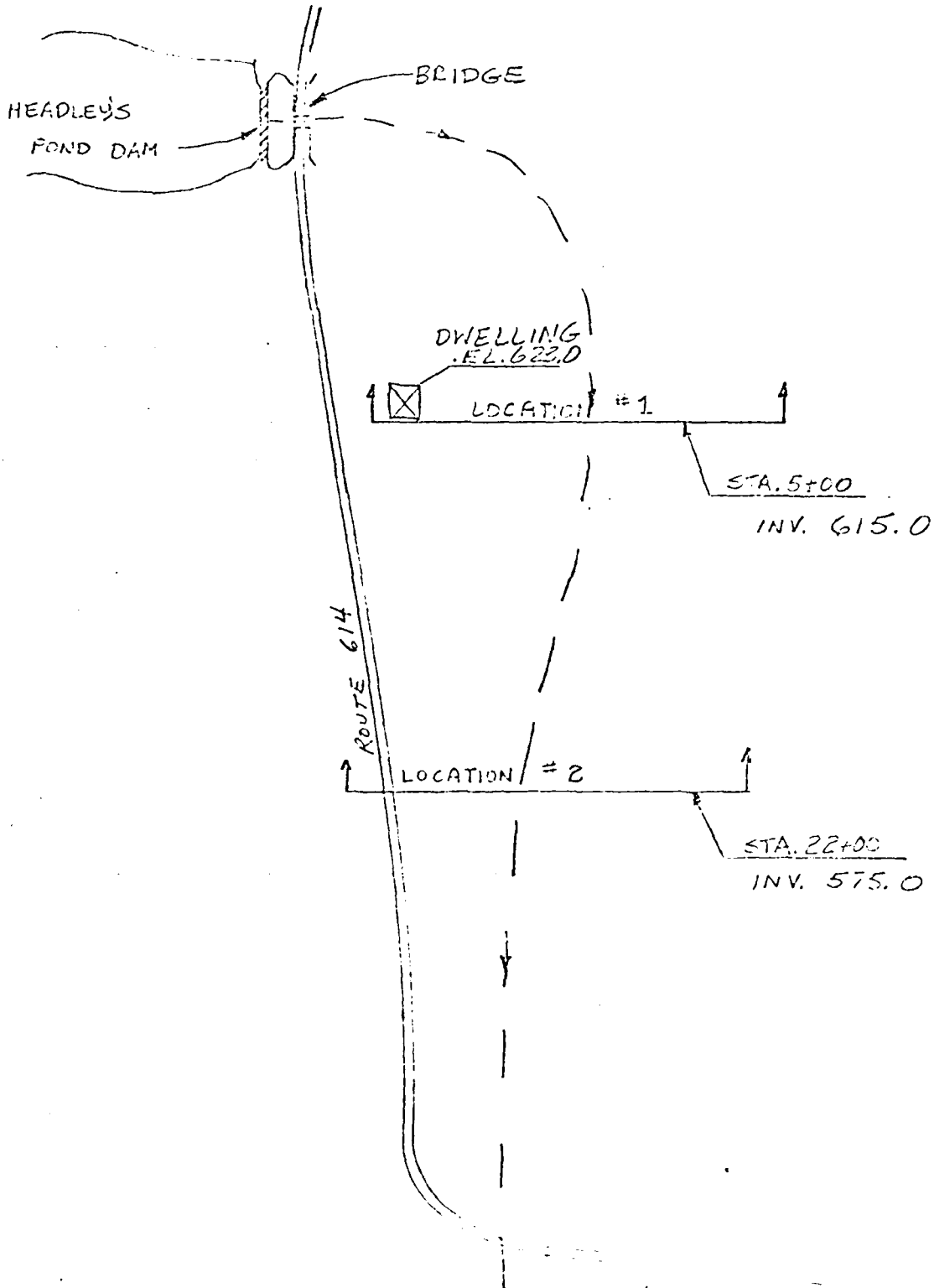
Sheet 2 of 12

Project HEADLEY'S POND DAM

Made By SG Date 11/81

Chkd By SG Date 3/10/81

BREACH ANALYSIS



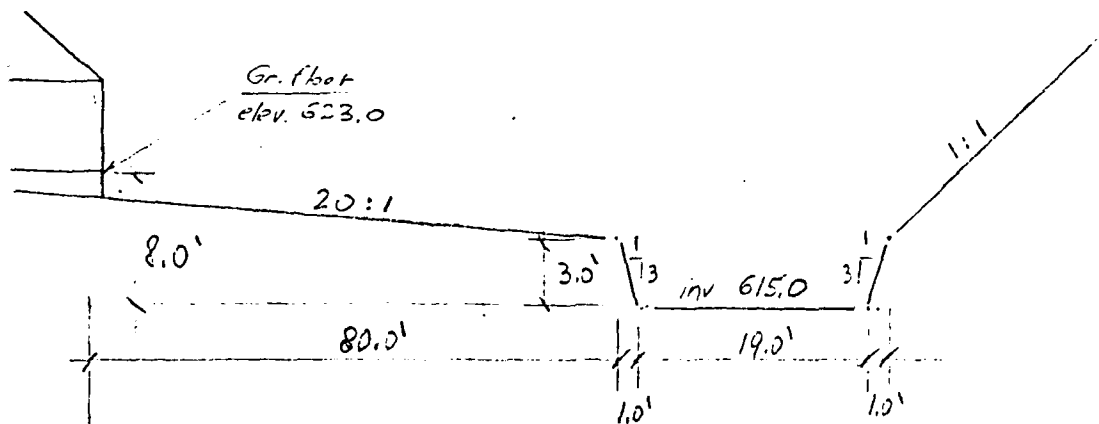
STORCH ENGINEERS

Sheet 10 of 12

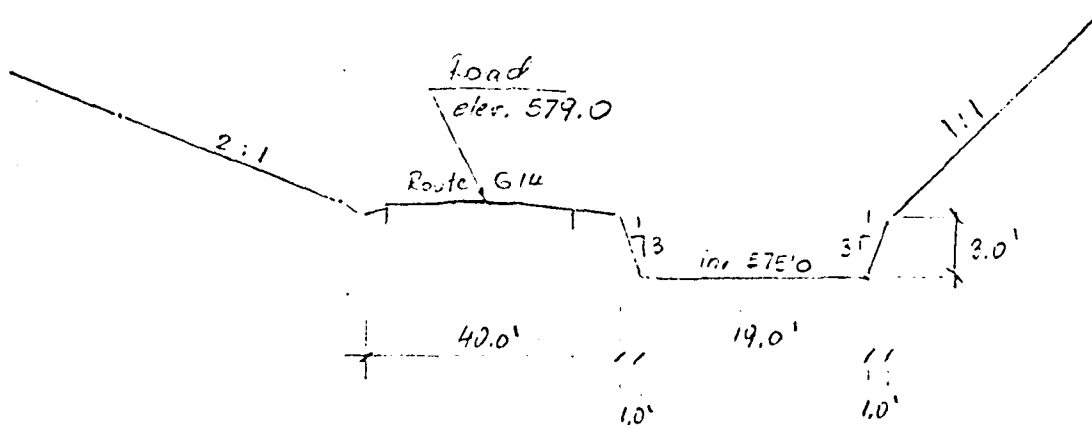
Project HEALEY'S FOND DAM Made By Date 1/13/11
Chkd By JS Date 2/10/11

TYPICAL CROSS-SECTION

Reach 1



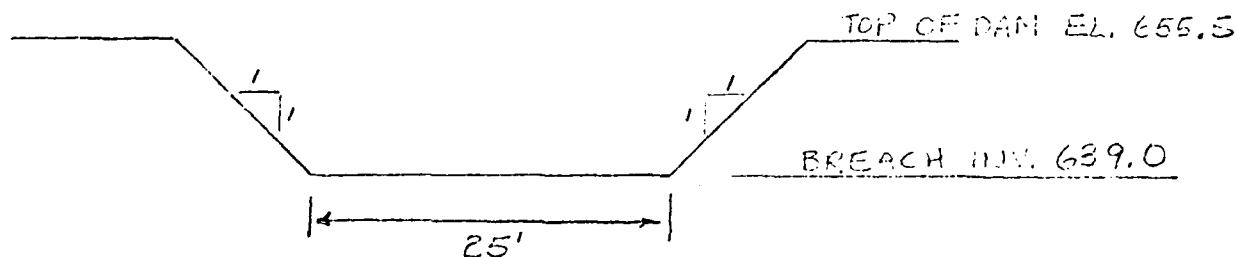
Reach 2



BREACH ANALYSIS (CONT.)

A BREACH HYDROGRAPH WILL BE COMPUTED BY THE HEC-1-DAM PROGRAM AND ROUTED THROUGH TWO DOWNSTREAM REACHES BY THE MODIFIED PULS METHOD. THE ASSUMED BREACH CONDITIONS ARE AS FOLLOWS:

1. THE BREACH BEGINS WHEN THE DAM IS OVERTOPPED BY 0.3 FEET.
2. TIME TO DEVELOP BREACH = 0.5 HOUR.
3. SECTION:



Project

HEADLEY'S FORD DAM

Made By

Date

Chkd By

Date

SPEACH RESULTS

1. Peak outflow

= 3,172.0 [cfs]

2. Max channel stage:

Reach 1

= inv. elev. 615.0 [ft]

max. stage elev. 621.0 [ft]

the building at cross section with G.F. elev. 622.0
will not be inundated

Reach 2

= inv. elev. 575.0 [ft]

max stage elev. 581.5 [ft]

the road (Rt. 614) at cross section with elev. 519.0
will be inundated by approx. 2.5 feet

HEC - 1 - DAM PRINTOUT

Overtopping Analysis

[illegible]

NATIONAL DAM SAFETY PROGRAM
HEADLEYS POND DAM NEW JERSEY
100 YEAR STORM ROUTING

NO 300 NHR 0 NMN 15 IDAY 0 JHR 0 IMIN 0 METRC 0 IPRT 4 NSTAN 0
JOPER 5 LROPT 0 TRAC 0

JOB SPECIFICATION

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NR110= 1 LR110= 1

RTIOS= 1.00

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH TO HEADLEYS POND DAM

ISIAQ 0 ICOMP 0 IECON 0 ITAPE 0 JPLI 0 JPRT 0 INAME 1 ISTAGE 0 IAU0 0
LAKE

IHYG 0 IUHG 2 IAREA 1.44 SNAP 0.00 TRSDA 0.00 TRSPC 0.00 RATIO 0.00 ISNOW 0 ISAME 1 LOCAL 0

HYDROGRAPH DATA

LOSS DATA
LROPT 0 STRKR 0.00 RTIOL 1.00 ERAIN 0.00 STRKS 0.00 RTIOK 1.00 STRIL 1.50 CNSTL 0.15 ALSMX 0.00 RTIMP 0.00

UNIT HYDROGRAPH DATA
IC= 0.00 LAG= 1.20

RECESSION DATA
STRTO= -1.00 DRCSN= -0.05 RTIOR= 2.00

NO.DA 0 HR.MN PERIOD RAIN EXCS LOSS COMP Q MO.DA HR.MN PERIOD RAIN EXCS LOSS COMP Q
SUM 7.12 4.33 2.79 16992.
(181.3) (110.3) (71.3) (481.16)

HYDROGRAPH ROUTING

ROUTE DISCHARGE THROUGH DAM

ISIAQ 0 ICOMP 1 IECON 0 ITAPE 0 JPLI 0 JPRT 1 INAME 1 ISTAGE 0 IAU0 0
DAM ROUTING DATA
QLOSS 0.00 CLOSS 0.00 AVG 0.00 IRES 1 ISAME 1 IOPT 0 IPMP 0 LSTR 0

STAGE 655.00 655.50 656.00 656.50 657.00 657.50 658.00 659.00 660.00 661.00
FLOW 0.00 0.00 37.00 106.00 194.00 417.00 691.00 1008.00 1362.00
SURFACE AREA= 0. 7. 14. 32.
CAPACITY= 0. 37. 290. 732.
ELEVATION= 639. 655. 680. 700.

CREL 655.5 SPVID 0.0 COOV 0.0 EXPV 0.0 ELFVL 0.0 COOL 0.0 CAREA 0.0 EXPL 0.0

DAM DATA
TOPEL 657.0 COOD 2.6 EXPD 1.5 DAMVID 20.

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
 FLOWS IN CUBIC FEET PER SECOND (CUMIC METERS PER SECOND)
 AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS	
				RATIO	1
HYDROGRAPH AT	LAKE	1.44 (3.73)	1	1566.	
				(44.35)	(
ROUTED TO	DAM	1.44 (3.73)	1	1521.	
				(43.07)	(
ROUTED TO	1	1.44 (3.73)	1	1524.	
				(43.16)	(
ROUTED TO	2	1.44 (3.73)	1	1518.	
				(42.98)	(

SUPMARY OF DAM SAFETY ANALYSIS

.....	ELEVATION STORAGE OUTFLOW	INITIAL VALUE 655.00 37. 0.	SPILLWAY CREST 655.50 41. 0.	TOP OF DAM 657.00 51. 194.			
RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	660.48	3.48	78.	1521.	4.75	19.00	0.00
PLAN 1 STATION 1							
RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	MAXIMUM STAGE,FT	MAXIMUM STAGE,FT	TIME HOURS	TIME HOURS	TIME HOURS
1.00	1524.	619.4	619.4	619.4	19.00	19.00	19.00
PLAN 1 STATION 2							
RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	MAXIMUM STAGE,FT	MAXIMUM STAGE,FT	TIME HOURS	TIME HOURS	TIME HOURS
1.00	1510.	579.8	579.8	579.8	19.00	19.00	19.00

HEC - 1 - DAM PRINTOUT

Breach Analysis

A1	NATIONAL	DAM SAFETY PROGRAM				
A2	HEADLEYS POND DAM NEW JERSEY					
A3	100-YEAR STORM ROUTING					
B	300	0	15	0	0	4
B1	5					
J	1	1	1			
J1	1					
K	0	LAKE	0	0	1	
K1	INFLOW	HYDROGRAPH TO HEADLEYS POND DAM				
M	0	2	1.44	1.44	0	1
D	56					
O1	0.019	0.019	0.019	0.019	0.019	0.019
O1	0.019	0.019	0.019	0.019	0.019	0.019
O1	0.019	0.019	0.019	0.019	0.019	0.019
O1	0.019	0.019	0.019	0.019	0.019	0.019
O1	0.019	0.019	0.019	0.019	0.019	0.019
O1	0.038	0.038	0.038	0.038	0.038	0.038
O1	0.083	0.083	0.083	0.083	0.083	0.083
O1	0.750	0.750	0.750	0.750	0.750	0.750
O1	0.083	0.083	0.083	0.083	0.083	0.083
O1	0.038	0.038	0.038	0.038	0.038	0.038
T					1.5	0.15
X	-1.0	-1.2	2.0			
X		-0.05				
K	1	DAM		1	1	
K1	ROUTE DISCHARGE THROUGH DAM					
Y	1		1	1		
Y1	1				-655.0	-1
Y4	655.0	655.5	656.0	656.5	657.0	658.0
Y5	0	0	37	106	194	417
S	0	6.8	13.8	31.7		
S	638.6	655.0	680.0	700.0		
S	655.5					
\$D	657.0	2.63	1.5	20		
\$2	25	1	639.0	0.5	655.0	657.3
K	1	1				1
K1	CHANNEL ROUTING REACH 1					
Y	1		1	1		
Y1	1					
Y6	0.1	0.04	0.1	615.0	630	500
Y7	0	630	5	623	80	500
Y7	101	618	106	624	112	630
K	1	2				1
K1	CHANNEL ROUTING REACH 2					
Y	1		1	1		
Y1	1					
Y6	0.1	0.04	0.1	575.0	595	1700
Y7	0	595	34	579	74	576
Y7	95	578	100	585	111	595
K	99					
A						
A						

STATION DAM

TIME (HRS)	(O) INTERPOLATED BREACH HYDROGRAPH (B) COMPUTED BREACH HYDROGRAPH	(*) POINTS AT NORMAL TIME INTERVAL
17.75	400.	2400.
17.76	B	2800.
17.77	B	3200.
17.78	B	
17.79	B	
17.80	B	
17.81	B	
17.82	B	
17.83	B	
17.84	B	
17.85	B	
17.86	B	
17.87	B	
17.88	B	
17.89	B	
17.90	B	
17.91	B	
17.92	B	
17.93	B	
17.94	B	
17.95	B	
17.96	B	
17.97	B	
17.98	B	
17.99	B	
18.00	B	
18.01	B	
18.02	B	
18.03	B	
18.04	B	
18.05	B	
18.06	B	
18.07	B	
18.08	B	
18.09	B	
18.10	B	
18.11	B	
18.12	B	
18.13	B	
18.14	B	
18.15	B	
18.16	B	
18.17	B	
18.18	B	
18.19	B	
18.20	B	
18.21	B	
18.22	B	
18.23	B	
18.24	B	
18.25	B	

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
 FLOWS IN CUBIC FEET PER SECOND (CUMIC METERS PER SECOND)
 AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN RATIO	RATIOS APPLIED TO FLOWS
			1	1.00
HYDROGRAPH AT	LAKE	1.44 (3.73)	1	1566. (44.35)
ROUTED TO	DAM	1.44 (3.73)	1	2763. (78.23)
ROUTED TO	1	1.44 (3.73)	1	2026. (80.02)
ROUTED TO	2	1.44 (3.73)	1	2922. (82.74)

SUMMARY OF DAM SAFETY ANALYSIS

.....	ELEVATION STORAGE OUTFLOW	INITIAL VALUE 655.00 37. 0.	SPILLWAY CREST 655.50 41. 0.	TOP OF DAM 657.00 51. 199.
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RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	657.71	.71	56.	3178.	.43	18.16	17.75

PLAN 1		STATION 1	
RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
1.00	2826.	621.0	18.25

PLAN 1		STATION 2	
RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
1.00	2922.	581.5	18.25

APPENDIX 5

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